October 31, 2012

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DEPARTMENT OF
ENVIRONMENTAL QUALITY

**HAND DELIVERED**

TESORO

Tesoro Refining and Marketing Company
474 West 900 North
Salt Lake City, UT 84103-1494
801 521 4810

Mr. Bryce Bird
Director
Utah Division of Air Quality
P.O. Box 144820
Salt Lake City, UT 84116

RE: **Comments on the Proposed $PM_{2.5}$ State Implementation Plan**

Dear Mr. Bird:

Tesoro Refining and Marketing Company, Salt Lake City Refinery respectfully submits the following comments on the proposed $PM_{2.5}$ State Implementation Plan ("SIP"). These comments are in response to the notices in the October 1, 2012 Utah State Bulletin (DAR Files 36721, et seq.) regarding the proposed $PM_{2.5}$ State Implementation Plan.

Tesoro supports the comments submitted by James Holtkamp on behalf of the Utah Manufacturers Association, the Utah Mining Association and the Utah Petroleum Association on October 30, 2012. In addition, Tesoro supports the refinery specific comments submitted by Lee Peacock of the Utah Petroleum Association.

In particular, Tesoro reiterates the following comment submitted by James Holtkamp:

> *"During development of the SIP, the oil refinery representatives met together with the UDAQ under the aegis of the Utah Petroleum Association (UPA). Additional individual meetings were held between the UDAQ permit engineers/staff and refinery representatives. In February 2012, each refinery was asked to submit a list of potential RACT technologies with their expected emissions reductions and costs (per ton of reduction). There was no feedback or discussion of the information submitted until August 2012, the close of the SIP development process, when the UDAQ presented emissions control spreadsheets to the refineries showing that most of the controls had been applied within the SIP modeling without regard to cost or reasonableness. Additionally, the refineries received from UDAQ a set of general PM2.5 SIP conditions to be applied to all refineries, which include new requirements for leak detection/repair, broader application of the New Source Performance Standard for Petroleum Refineries (Subpart Ja), and the administrative process that affects RACT–NSPS applicability. The UPA had three days to review these proposed rules and submit comments, which it did but without adequate time for review and refinement by its stakeholders. The refinery representatives are concerned that the fast pace of the SIP development process has not allowed adequate input, review and decision-making needed for a complete SIP. "*

*General Comments*

Tesoro received informally from UDAQ an electronic spreadsheet containing the emissions information that was reportedly used for the State's $PM_{2.5}$ model. A cursory analysis indicated multiple errors for which Tesoro submitted updated emissions information. This updated information was not included in the data that was modeled. These discrepancies should be corrected before relying on the results of the model. Please refer to comment #7 in the comment letter submitted by James Holtkamp on behalf of the Utah Manufacturers Association, the Utah Mining Association and the Utah Petroleum Association on October 30, 2012, in which similar issues are raised on the model input data for various sources. These discrepancies raise general concerns about data integrity for other sources used in the model to demonstrate attainment with the $PM_{2.5}$ standard. Further comments relative to this spreadsheet are presented below.

*Comments on adding a new State Implementation Plan (SIP) Subsection IX.A.21: Control Measures for Area and Point Sources, Fine Particulate Matter, $PM_{2.5}$ SIP for the Salt Lake City, UT Nonattainment Area.*

Within the first paragraph of Section 6.6 "Reasonably Available Control Measures (RACM/RACT)," UDAQ states that potential control measures *must* be shown to be both technologically and economically feasible. The RACT analysis for each source is then presented in the Technical Support Document (TSD), which describes technological and economic feasibility. UDAQ has not specified an applicable RACT threshold at which control measures are economically feasible. UDAQ should determine the RACT threshold at which controls are economically feasible and run the model with that level of control. This information should then be provided for public comment.

Subsequent to October 1, 2012 when the $PM_{2.5}$ SIP Package was issued for public comment, UDAQ posted omitted information on their website. Tesoro's TSD cover letter was one document that was omitted. Tesoro was not informed of this omission. The cover page included the following statement:

> As part of the overall strategy for controlling emissions at the refineries, Tesoro also investigated the control options of NSPS Subpart Ja and NESHAP Subpart GGGa. These controls are already included in the general requirements Section IX.H.11.

Although controls equivalent to NSPS Subparts Ja and GGGa may be included in the proposed Section IX.H.11, the information that follows the TSD cover letter is a detailed analysis demonstrating that several controls proposed in IX.H.11, as well as the 2019 projected emissions from Table 6.3 and TSD 3.b.ii.E, are not economically feasible for the Tesoro Refinery. Please refer to the TSD Section 5.c.xxxiii for Tesoro's RACT analysis and Tesoro's comments below regarding Section IX.H.11.

Table 6.3 lists daily emission totals for point sources. Note that Tesoro provides comments relative to the projected annual emissions from the TSD 3.b.ii.E later in this letter. As noted in the General Comments above, the emissions used by the State are incorrect. The data for Tesoro from Table 6.3 is presented below.

| Typical Winter Inversion Weekday Emissions (tpd) | | | 2008_E10_R9DM3 080212 Baseline | | | | | 2014_E10_R21DM3 081012 Growth & Control | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source Category | NA-Area | Site | PM2_5 | NOX | VOC | NH3 | SOX | PM2_5 | NOX | VOC | NH3 | SOX |
| Point Sources | Salt Lake City, UT | | | | | | | | | | | |
| | | Silver Eagle Refining | 0.012 | 0.240 | 0.308 | 0.014 | 0.003 | 0.011 | 0.240 | 0.304 | 0.012 | 0.003 |
| | | Tesoro Refinery | 0.665 | 1.089 | 0.748 | 0.010 | 2.517 | 0.663 | 1.051 | 0.744 | 0.010 | 2.508 |

| Typical Winter Inversion Weekday Emissions (tpd) | | | 2017_E10_R1DM3 082112 Growth & Control | | | | | 2019_E10_R36DM3 081012 Growth & Control | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source Category | NA-Area | Site | PM2_5 | NOX | VOC | NH3 | SOX | PM2_5 | NOX | VOC | NH3 | SOX |
| Point Sources | Salt Lake City, UT | | | | | | | | | | | |
| | | Silver Eagle Refining | 0.011 | 0.075 | 0.284 | 0.004 | 0.003 | 0.011 | 0.075 | 0.284 | 0.004 | 0.003 |
| | | Tesoro Refinery | 0.275 | 1.167 | 0.852 | 0.010 | 2.127 | 0.085 | 0.729 | 0.798 | 0.010 | 0.513 |

Tesoro believes the above 2019 projected emissions are based on the same information that was provided informally to Tesoro in the spreadsheet titled "*Tesoro Refinery 10335 PM2.5 SIP RACT.xls*" (TSO

Spreadsheet). Excerpts directly from this spreadsheet are detailed below. Tesoro believes no RACT analysis was performed nor stipulated when UDAQ proposed the control strategies for 2019 for Tesoro. Tesoro provides comments below relative to the TSO Spreadsheet as that is the basis for the 2019 projected emissions which are detailed in IX.A.21 Table 6.3 and TSD 3.b.ii.E.

| |
|---|
| Remaining RACT controls identified are then applied |
| |
| Subpart Ja controls imposed as state rules yield: |
| Flare gas drops to 135? ppm |
| Fuel gas H2S drops to 60 ppm |
| Total Reductions in SO2 perhaps 10 TPY |
| |
| |
| |
| |
| Installation of a Wet Gas Scrubber on the SRU/FCCU |
| Substantial SO2 and some PM reductions |
| Total Change -600 TPY SO2, -70/-75 TPY PM2.5/PM10 |
| |
| |
| |
| Tank upgrades (including slotted guide poles, etc) |
| Perhaps 15 TPY VOC reductions total |
| |
| |
| Upgrades to NG-ULNB or SCR |
| Main reductions -100 tpy NOx at FCCU |
| |
| |
| |
| Installation of additional controls at the Cogen turbines |
| SCR would be the only real savings but perhaps |
| 50% NOx reductions |
| |
| |
| Installation of additional VOC control prior to cooling towers |
| Not sure what this would entail, but VOC emissions went |
| way up since 2008. Cut by 20%? |
| |

Tesoro submitted comments to UDAQ in response to the above proposed controls on August 22, 2012 and September 24, 2012. The comments are summarized here and included in Attachment 1.

*In response to "Subpart Ja controls imposed as state rule yield:"*
NSPS Subpart Ja states that the owner or operator shall not burn fuel gas with more than 60 ppmv $H_2S$, based on a 365-day rolling average. The 2008 $SO_2$ emissions are based on an average $H_2S$ content of 37 ppmv. Additionally, the projected $H_2S$ content at the refinery used to calculate 2017 emissions is 50 ppm. Since the standard is already being met, no reductions compared to 2017 emissions would occur from enforcing the standard.

With respect to estimated SRU Flare reductions of 7 tpy, emissions are difficult to predict since they result solely from SSM events at the SRU. There are no routine emissions from the SRU Flare.

*In response to "Installation of a Wet Gas Scrubber on the SRU/FCU"*
A Wet Gas Scrubber (WGS) on the FCCU is not economically feasible. The $PM_{2.5}$ control cost is

estimated at $400,000+/ton, and the $SO_2$ control cost is estimated at $18,800+/ton. Please see the Tesoro TSD Section 5.c.xxxiii pages 1 through 7. Furthermore, if a WGS were installed, Tesoro would expect reductions of approximately 21 tpy $PM_{2.5}$ and 638 tpy $SO_2$.

Specifications for filterable $PM_{2.5}$ are equivalent to current operations with the ESP (i.e., no reduction expected). There is less certainty in the estimate of $PM_{2.5}$ reductions due to the chemistry in the WGS where some condensibles are scrubbed and potentially others are created. A modest reduction of condensible PM2.5 may occur through control of sulfuric acid mist emissions.

*In response to "Tank Upgrades (including slotted guidepole controls, etc.)"*
This estimate is consistent with the RACT screening analysis previously submitted by Tesoro.

*In response to "Upgrades to NG-ULNB or SCR"*
NOx controls on the FCCU are not economically feasible. NOx control cost estimates for Tesoro are detailed in the TSD Section 5.c.xxxiii pages 7 through 12.

*In response to "Installation of additional controls at the Cogen turbines"*
SCR installation on the Cogen units is not economically feasible. NOx control cost is estimated at $22,000+/ton using the EPA cost control manual and vendor specific supplied information. NOx control cost estimates for Tesoro are detailed in the TSD Section 5.c.xxxiii pages 14 through 15.

*In response to "Installation of additional VOC control prior to cooling towers"*
Implementation of heat exchanger standards under MACT Subpart CC are in place as of October 29, 2012. Heat exchanger standards are in place to reduce VOC emissions at cooling towers. The projected emissions as part of the Waxy Crude Processing Project (reflected in 2017 estimates) accounted for implementation of these standards. Further reductions would not occur beyond those estimates. Emissions in 2008 were based on AP-42 emission factors. The increase observed since 2008 is due to monitoring of the VOC content of the cooling water, which did not occur until 2009. The RACT analysis is detailed in the TSD Section 5.c.xxxiii page 21.

*Additional comments:*
The emissions from the compressor K1a in 2017 and 2019 reflects the total emissions expected from K1a plus K1b. Tesoro suggests NOx emission rates of 7.89 tpy for each of K1a and K1b for 2017 and 2019.

The GHT Process Heater point source F-701 is not listed in this spreadsheet. Please include the following projected emissions (2014, 2017, and 2019) as detailed in the August 22, 2012 email to UDAQ:

| | NOx | SO2 | CO | PM10 | PM2.5 | VOC |
|---|---|---|---|---|---|---|
| | tpy | tpy | tpy | tpy | tpy | tpy |
| Projected Emissions | 2.33 | 0.24 | 2.60 | 0.23 | 0.23 | 0.17 |

Tesoro requests the basis for reduction in miscellaneous VOC sources when comparing 2008 to 2014 emission rates.

Tesoro requests that the projected 2019 emissions be corrected and listed as specified in the 2017 projected emissions table. These emissions reflect the post-project emissions as detailed in the Waxy Crude Project NOI.

Table 6.4 identifies control strategies that were either "retained," meaning pursued, "screened, " meaning rejected, or "mixed," meaning parts were pursued and parts rejected. For area sources, requiring low-NOx burners on commercial and institutional water heaters was "screened" because NOx reduction impairs attainment of $PM_{2.5}$. However, in Table 6.6, UDAQ proposes to study the feasibility of requiring low-NOx burners on existing boilers and furnaces as an additional SIP control for point sources. How does the Agency justify further consideration of any new controls on NOx emissions from point sources? This item should be eliminated due to the reason cited for areas sources. Tesoro supports comments previously submitted by UPA on a Draft "Emission Standards: Boilers, Steam Generators, and Process Heaters" regulation in a letter dated August 10, 2012 and is attached for your convenience (Attachment 2)

Section 6.7 includes consideration to reduce the RVP of gasoline sold during specific wintertime periods when inversions are likely to occur. However, using the MOVES2010 to estimate the impact of RVP on exhaust VOC emissions extends the relationship well beyond the data upon which the corrections were developed. The model is intended to simulate summertime conditions, and cannot reliably be extrapolated to wintertime conditions. Using a new model (MOVES 2013), currently being reviewed by the Federal Advisory Committee will demonstrate that reducing the RVP in the wintertime will have no discernible effect on VOC emissions. This consideration should be dropped and other alternative source reduction measures investigated by UDAQ. Tesoro supports the comments submitted by UPA dated October 31, 2012 relative to RVP reduction (refer to Attachment 2 of the UPA letter). Tesoro is also providing alternative suggestions to RVP reduction which are included in Attachment 3 of this letter.

Section 6.7 retains consideration of flare gas recovery as an additional SIP control. The EPA has finalized NSPS Subpart Ja for refineries on September 12, 2012 (77 FR 56422), which includes regulations for flaring. This regulation will be applicable to the Tesoro Salt Lake City Refinery flares. If DAQ maintains flare controls as a potential control strategy, a provision should be included that indicates compliance with Subpart Ja meets the requirements of the SIP and/or resulting rule. Tesoro has also commented on this issue as it pertains to Section IX.H.11.a.viii of the SIP.

Section "9.4, Conclusions" states the following: "*The control strategy analysis summarized in Chapter 6 shows that stationary sources already meet or exceed RACT, and represent at most about 20% of the emissions contributing to excessive PM2.5 concentrations during winter.*" The focus of control strategies should be on the major contributors, recognizing that further reductions from point sources will likely be at high cost with little or no benefit. Point source measures should be dropped unless they can be shown to be technologically feasible and cost effective in the RACT analysis and individually demonstrated to show benefit towards achieving the $PM_{2.5}$ NAAQS.

*Comments on $PM_{2.5}$ Technical Support Documentation*

While the TSD provides information related to the suggested control measures, it does not provide a determination or demonstration of the cost per ton of reduction in pollutants that would describe Reasonably Available Control Technology (RACT). It is difficult now, and is anticipated to become even more difficult as DAQ attempts to further define the control strategies that will facilitate meeting the air quality standards, to evaluate the applicability of such strategies in the absence of a determination of economic feasibility under RACT.

*TSD 3.b.ii.E. 2019 Projected Annual Emissions (Condensables and RACT Included)*

Tesoro believes the 2019 projected emissions (annual) are based on the same information that was provided informally to Tesoro in the spreadsheet titled "*Tesoro Refinery 10335 PM2.5 SIP RACT.xls*" (TSO Spreadsheet). Tesoro believes there was no RACT analysis performed or stipulated when UDAQ proposed the control strategies for 2019 for Tesoro. Please refer to Table 6.3 comments above which detail Tesoro's comments relative to these projected emissions. As stated above, Tesoro requests that the projected 2019 emissions be corrected and listed as specified in the 2017 projected emissions table.

These emissions reflect the post project emissions as detailed in the Waxy Crude Project NOI.

*Comments on R307-101-2. General Requirements. Definitions.*
Tesoro supports the comments previously submitted October 18, 2012 by James Holtkamp on behalf of the Utah Manufacturers Association, the Utah Mining Association and the Utah Petroleum Association. Specifically, without a proposed version of R307-422 available for comment Tesoro cannot adequately evaluate the proposed definitional changes to R307-101-2.

*Comments on adding new State Implementation Plan (SIP) Subsections IX.H.11, 12, and 13. Control Measures for Area and Point Sources, Emission Limits and Operating Practices, PM2.5 Requirements.*

The requirements listed in IX.H.11.a.i, iv, vi, vii, viii, and xi specify that they are to be implemented "as soon as practicable." Such requirements provide no definition for regulated entities, and only make compliance and enforcement more difficult. While it is recognized that the EPA may have specified that the air quality standards be achieved "as soon as practicable," this should not be simply restated in the SIP. Part of the RACT analysis is not only the assessment of cost per ton of emission reduction, but also the assessment of how soon controls can reasonably be put into place.

The requirements listed in IX.H.11.a.ix do not list a compliance timeline.

The controls proposed for refineries are extensive. The proposed controls would each take a great deal of resources to design, construct and put into service. In addition, many refineries would require a turnaround as part of tying in necessary connections. Therefore, a firm compliance date is necessary so that it is possible to plan and make sound business decisions around installing the controls. As noted above and below, Tesoro does not consider the proposed controls to be RACT, but offers this comment should the rules be finalized.

*Comments on IX.H.11.a. General Requirements – Petroleum Refineries*

H.11.a.i.-iii. – It appears that the State is proposing to make the refining industry in Utah subject to the latest NSPS requirements, regardless of the date of source construction. However, the actual reduction in emissions achieved by reducing the leak detection limit below 10,000 ppm is minimal, so the benefit to achieving the $PM_{2.5}$ standard will also be minimal, and the corresponding cost per ton of reduction high. In addition, the NSPS provisions were meant to cover new units, which can be designed and installed with the appropriate emission controls. We are not sure it is even possible to retrofit existing compressors with a pressurized barrier fluid as required by the NSPS regulations, and the benefit would again be minimal, as these seals are already monitored for leaks under the LDAR program. This consideration should be dropped unless it is shown to be beneficial in the RACT analysis.

H.11.a.iv. – These emission limits were intended for modified FCCUs. Applying them to existing sources may not be possible without significant cost. Pollution control equipment, specifically a Wet Gas Scrubber (WGS), would need to be installed at the Tesoro Refinery. UDAQ has not demonstrated that installation of a WGS for the Tesoro Refinery is both technically and economically feasible. Tesoro submitted control costs on August 22, 2012 as well as September 24, 2012 which we believe demonstrate the costs are not economically feasible. This information was later directly incorporated into the TSD. Please refer to the TSD Section 5.c.xxxiii pages 1 through 7 for Tesoro's basis that a WGS does not meet RACT for the Tesoro Refinery.

If this limit remains, Tesoro requests a compliance date of January 1, 2019 which would prevent an out-of-cycle shutdown of the refinery to tie in the WGS. The FCCU is currently scheduled for major outages in 2013 and 2014. A WGS could not be engineered and constructed during either of these

scheduled outages, nor would it be economically feasible to install tie-in points for a scrubber during those outages.

H.11.a.v. – There should be some kind of allowance that states that if the source is already complying with these specific or more stringent FCC limits, then an additional performance test is not required. Moreover, Tesoro believes that compliance monitoring of sulfur dioxide ($SO_2$) emissions from FCC regenerators should be done by certified Continuous Emissions Monitoring Systems (CEMS) rather than periodic stack testing. The proposed limit is based on a seven-day rolling average determination and should therefore require continuous monitoring to adequately demonstrate compliance with it.

H.11.a.vi.A. – This emission limit is from NSPS Subpart Ja under §60.102a(f)(2) for sulfur recovery plants with a capacity of 20 LTD or less and which operate with an oxidation control system. Again, these restrictions were developed for new or modified sources. Tesoro plans to build a Tail Gas Treatment Unit (TGTU) per the Waxy Crude Project NOI. Tesoro believes these limits can be met with the proposed control device. However Tesoro requests that an average period be specified in H.11.a.vi.A for demonstrating compliance. Tesoro proposes a seven-day rolling average basis consistent with the averaging period for under H.11.a.iv.B.

H.11.a.vii.B – Tesoro believes this statement should be modified to read, "An owner or operator shall not combust fuel gas in any Fuel Gas Combustion Device (FGCD) that contains $H_2S$ in excess of 162 ppmv determined hourly on a three-hour rolling average basis."

H.11.a.vii – x. – These paragraphs appear to be from the federal regulation for NSPS Subpart Ja. Since that regulation has been finalized, this section should be deleted to prevent confusion. See "Section 6.7" comments above.

H.11.a.iv-vii – These emission limitations were modeled after NSPS Ja, and NSPS Ja includes exemptions for startup, shutdown and malfunction. Tesoro recommends that UDAQ include a similar exemption to the proposed limits on FCC's, SRU's, and fuel gas combustion devices during startup, shutdown, and malfunction events.

H.11.a.viii - The EPA has finalized NSPS Subpart Ja for refineries on September 12, 2012 (77 FR 56422), which includes regulations for flaring. This regulation will be applicable to the Tesoro Salt Lake City Refinery flares. Tesoro therefore requests removal of this section from the SIP. At a minimum, Tesoro requests that the SIP directly reference the requirements within Subpart Ja rather than creating duplicative requirements.

H.11.a.xi. - It is unclear to Tesoro what "sources" will be required to have $PM_{2.5}$ testing to establish a $PM_{2.5}$ emission factor because there are no emission limits expressed in terms of $PM_{10}$ in this section. The Tesoro Refinery $PM_{10}$ cap includes gas fired compressor drivers and all external combustion process equipment, including the FCCU/CO Boiler. Tesoro requests that UDAQ exclude heaters, boilers, gas fired compressor drivers and all external combustion equipment with the exception of the FCCU/CO Boiler from the stack testing requirements. Tesoro requests that UDAQ allow for the use of AP-42 factors when determining PM2.5 emissions for all other sources.

Tesoro requests that UDAQ provide the RACT analysis which demonstrates that the controls specified in IX. H.11.a.i – xi are technically and economically feasible. In addition, Tesoro requests the modeling data that shows these controls will demonstrate further progress towards attainment of the $PM_{2.5}$ standard.

*Comments on IX.H.11.r –Tesoro Refining and Marketing Company - Salt Lake City Refinery*

IX.H.11.r.i.A - The $PM_{10}$ limits should be specified as filterable-only emission limits. These limits were carried forward from the 2005 $PM_{10}$ SIP. The limit was developed for filterable emission rates only and should be specified as such.

IX.H.11.r.ii.A – Tesoro requests the proposed $PM_{2.5}$ limit be listed as applicable January 1, 2019:

> *Emissions of PM2.5 from the FCCU/CO Boiler shall be no greater than 4 lb/mmscf. Compliance shall be demonstrated with this limit by January 1, 2019.*

The initial version of IX.H.11.r.iii and .iv presented to Tesoro also included $SO_2$ and NOx annual limits, consistent with the current SIP. Tesoro requests that the limits be included. Tesoro proposes the following:

> *12-MONTH LIMIT: Emissions of SO2 from the entire facility shall not exceed 1,637 tons per rolling 12-month period.*
>
> *12-MONTH LIMIT: Emissions of NOX from gas-fired compressor drivers and all external combustion process equipment shall be no greater than 598 tons per rolling twelve-month period.*

IX.H.11.r.iv.B - The NOx emissions determinations listed are inconsistent with the current AO DAQE-AN103350058-12. The NOx determination for the FCU and GHT heater are missing. Please refer to DAQE-AN103350058-12, page 16 for the proper method which should be incorporated into this section of the SIP. In addition, the method listed in r.iv.B.III should be revised as follows:

> *"…Testing shall be performed at each train either simultaneously or seriatim at least once every two years."*

IX.H.11.r.iv.C – Consistent with the current AO DAQE-AN103350058-12 Tesoro requests the following correction to the gas-fired compressor driver limits:

> *Emissions of NOx from each gas fired compressor driver shall be no greater than 3.20 lb/hr or 933 ppmdv @10% oxygen and 400 def F.*

Thank you for the opportunity to provide comments. Tesoro will continue to support UDAQ in their efforts to model attainment for the $PM_{2.5}$ SIP. Should you have any questions regarding these comments, please do not hesitate to contact me.

Sincerely,

Matthew Buell

Matthew Buell
Health, Safety and Environmental Manager

Attachment

# Attachment 1

**From:** Bujdoso, Michelle D
**To:** (jjenks@utah.gov);
**cc:** Bujdoso, Michelle D; twidboom@barr.com;
**Subject:** FW: Spreadsheet
**Date:** Wednesday, August 22, 2012 3:51:48 PM
**Attachments:** Tesoro Refinery 10335 PM25 SIP RACT2.XLSX

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John,

Tesoro submits the following comments . The comments are not reflected in the spreadsheet.

**UDAQ:** ***Subpart Ja controls imposed as state rules yield:***
***Flare gas drops to 135? ppm***
***Fuel gas H2S drops to 60 ppm***
***Total Reductions in SO2 perhaps 10 TPY***
NSPS Subpart Ja states that the owner or operator shall not burn fuel gas with more than 60 ppmv H2S, based on a 365 day average. In 2008, the average H2S content in 2008 was 36.87 ppmv. Additionally, the projected H2S content at the refinery used to calculate 2017 emissions is 50 ppm. Since the standard is already being met, no reductions compared to 2017 emissions would occur from enforcing the standard. With respect to estimated SRU Flare reductions of 7 tpy, emissions are difficult to predict since they result solely from SSM events. There are no routine emissions from the SRU Flare.

**UDAQ:** ***Installation of a Wet Gas Scrubber on the SRU/FCCU***
***Substantial SO2 and some PM reductions***
***Total Change -600 TPY SO2, -70/-75 TPY PM2.5/PM10***
WGS on the FCCU is not economically feasible. Please refer to the letter submitted 8/22/12 to UDAQ for further details. PM2.5 control cost is estimated at $400,000+/ton, and SO2 control cost is estimated at $18,800+/ton. If a WGS were installed, Tesoro would expect reductions of approximately 21 tpy PM2.5 and 638 tpy SO2. Specifications for filterable PM2.5 are equivalent to current operations with ESP (i.e., no reduction expected). A modest reduction of condensable PM2.5 may occur through control of sulfuric acid mist emissions.

**UDAQ:** ***Tank Upgrades – 15 tpy VOC Reduction***
This estimate is consistent with the RACT screening analysis previously submitted by Tesoro.

**UDAQ:** ***Main reductions -100 tpy NOx at FCCU***
NOx controls on the FCCU are not economically feasible. NOx control cost estimates are detailed in the 8/22/12 letter submitted to UDAQ.

**UDAQ:** ***Installation of additional controls at the Cogen turbines***
***SCR would be the only real savings but perhaps***
***50% NOx reductions***
SCR on the Cogen units is not economically feasible. NOx control cost is estimated at $22,000+/ton using the EPA cost control manual. Tesoro is pursuing a detailed estimate from a vendor. Information to be submitted upon completion.

**UDAQ:** ***Installation of additional VOC control prior to cooling towers***

***Not sure what this would entail, but VOC emissions went way up since 2008.***

***Cut by 20%?***
Implementation of heat exchanger standards under MACT Subpart CC will be in place by October 2012. The projected emissions as part of the Waxy Crude Processing Project (reflected in 2017 estimates) accounted for implementation of these standards. Further reductions would not occur beyond those estimates. The increase observed since 2008 is due to monitoring of the VOC content of the cooling water, which did not occur until 2009. Emissions in 2008 were based on AP-42 emission factors.

**Other Tesoro Comments**
The emissions from K1a in 2017 and 2019 (15.77 tpy) reflect the total emissions expected from K1a plus K1b. Tesoro suggests emission rates of 7.9 tpy for each of K1a and K1b for 2017 and 2019.

The GHT Process Heater point source F-701 is not listed in this spreadsheet. The GHT only ran for 14 days in 2008. Below are 2019 projected emissions.

| | NOx | SO2 | CO | PM10 | PM2.5 | VOC |
|---|---|---|---|---|---|---|
| | tpy | tpy | tpy | tpy | tpy | tpy |
| Projected Emissions | 2.33 | 0.24 | 2.60 | 0.23 | 0.23 | 0.17 |

What is basis for reduction in miscellaneous VOC sources when comparing 2008 (~86 tpy)to 2014 (77.43 tpy) emission rates?

Please let me know if you have any questions.

Thanks,
Michelle Bujdoso

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**From:** John Jenks [mailto:jjenks@utah.gov]
**Sent:** Friday, July 27, 2012 1:46 PM
**To:** Bujdoso, Michelle D
**Subject:** Spreadsheet

Michelle,

As promised, here is a copy of the spreadsheet being used for the RACT 2.0 modeling runs. Contact me next week with any questions you may have on it.

- John

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AUG 22 2012
DEPARTMENT OF
ENVIRONMENTAL QUALITY

August 22, 2012

TESORO

Tesoro Refining and Marketing Company
474 West 900 North
Salt Lake City, UT 84103-1494
801 521 4810

Mr. John Jenks
Utah Division of Air Quality
150 North 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820

**HAND DELIVERED**

**Re: Tesoro Refining and Marketing Company - Salt Lake City Refinery**
**Comments on Proposed Refinery Rule and Tesoro Specific SIP Limits**
**PM2.5 SIP**

Tesoro supports the efforts of the Utah Department of Air Quality to meet the PM2.5 24-hour standard through the State Implementation Plan process. Tesoro appreciates the opportunity to provide comments to the Utah Department of Air Quality (UDAQ) on draft rules that affect our industry. However, sufficient time should be allowed for thoughtful consideration and preparation of meaningful comments. We understand that the SIP package will be mailed to the Board on August 22nd. We received the initial draft of the *General Requirements – Petroleum Refineries (Refinery Rule)* and *Tesoro Specific SIP Limitations* on the evening of August 14, 2012 and comments were requested by August 17, 2012. This is not an adequate amount of time to review and provide comments. Given the time constraints Tesoro is providing the following general comments. These comments should not be viewed as comprehensive. Tesoro also supports the comments submitted by UPA (dated August 17, 2012) and reiterates many of those comments here with specific examples relative to Tesoro.

Tesoro is concerned that this proposed Refinery Rule as well as the Proposed Heater and Boiler Rule are not Utah specific and do not specifically address the wintertime air quality issues. Tesoro is also concerned that the Reasonably Available Control Measure (RACT/RACM) process has not been followed to establish these generally applicable requirements.

Both the Heater and Boiler rule and the Refinery Rule are proposing reductions in NOx emissions. The proposed reductions in NOx would result in no demonstrated PM2.5 air quality benefits and according to data provided by UDAQ may actually increase PM2.5 concentrations. Tesoro requests that UDAQ provide data which adequately supports the conclusion that the required NOx controls under this proposed rule show progress towards improving PM2.5 attainment. UDAQ has also not demonstrated that these proposed NOx reduction requirements meet RACT. Data will be presented later in this letter which Tesoro believes demonstrates the NOx controls do not represent RACT.

DAQ has provided Tesoro three days to comment on a rule that will have significant cost and operational impacts to our refinery. This is not sufficient time to evaluate the rule for all potential impacts and provide substantive comments. Below are initial comments:

> H.11.a. i-iii would require the refinery to comply with 40 CFR 60.482-1a to 60.482-10a (part of NSPS Subpart VVa). These regulations are applicable to the Synthetic Organic Chemicals Manufacturing Industry. The proposed rule ignores the NSPS regulations specific to Petroleum Refineries (40 CFR 60 GGGa) which do reference certain portions of NSPS VVa. Tesoro has been meeting the lower leak definitions required in these rules since approximately 2003 when similar limits went into effect under a Consent Decree

entered into with EPA. Tesoro does not specifically object to this section of the proposed rule other than to reference GGGa as applicable versus VVa.

The requirements listed in H.11.a.iv,v,vi,and vii ignore the applicability criteria established in the NSPS Subpart Ja standard. The more stringent limits are proposed regardless of the new, modified, or reconstructed status of the emission unit. The NSPS rules represent Best Demonstrated Technology and are not equivalent to RACT. The state has not presented a RACT analysis which demonstrates these controls are reasonable. Tesoro will present data below which we feel demonstrates these more stringent controls do not represent RACT.

The January 1, 2018 timeframe to meet the FCU, Sulfur Recovery Plant, Fuel Gas Combustion Device, and Flare Management Plan requirements may require out-of-cycle turn-arounds for the Tesoro refinery. UDAQ has also stated that this date may be advanced so as to standardize the compliance dates. The timeframe is not adequate in some cases. Further discussion will follow.

H.11.a.iv.A – FCU PM limit 0.5 lb/1000 lb coke burn

UDAQ is proposing the NSPS Ja standard which applies only to new FCUs, for all FCUs covered under the proposed Refinery rule. In developing this standard for new FCUs, EPA demonstrated that the limit was the Best Demonstrated Technology for new sources only. The Best Demonstrated Technology limit for modified or reconstructed sources is 1 lb PM/ 1,000 lb coke burn. In communications between UDAQ and various refineries regarding the PM2.5 State Implementation Plan (SIP), a 1 lb PM/1,000 lb coke burn limit was discussed rather than this more restrictive NSPS Ja limit which applies to new FCUs. Tesoro proposes that the NSPS Ja 1 lb PM / 1,000 lb coke burn limit for reconstructed or modified FCUs be adopted.

In the NSPS Ja rule, the PM limit is for filterable PM only. This proposed rule does not have the same specificity. One could potentially infer that in the rule as proposed, the limit also includes condensable PM. This issue has been communicated many times by UDAQ in meetings. Tesoro proposes that the compliance method be stated and that any limit based upon NSPS Ja should include filterable PM only.

Tesoro has determined that additional controls would be required to meet the more stringent 0.5 lb/1000 lb coke burn limit. Tesoro previously submitted a FCU Best Available Control Technology (BACT) analysis to UDAQ for the Waxy Crude Project. Tesoro is in the process of updating this analysis based on the most recent cost information. Included below is a summary of the current detailed cost analysis for the Tesoro FCU. These costs are based on installation of a wet gas scrubber guaranteed to meet a specification of 0.5 lb filterable PM per 1000 lb coke burn. The emission reductions reflected below are engineering estimates of reductions in condensable PM emissions based on the level of control of sulfuric acid mist emissions, plus reductions in filterable PM emissions from the current emission rate down to 0.5 lb filterable PM per 1000 lb coke burn. Because all sulfuric acid mist emissions may not result in condensable PM emissions, this estimate of emission reductions is expected to be conservatively high. Note the control technologies listed and associated efficiencies are downstream of the currently installed ESP. ESPs have a level of efficiency greater than 90% at ideal operating conditions.

Below is a summary of the PM2.5 control options and costs:

**PM2.5 Control Options**

| Control Technology | Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Control Cost ($/ton) |
|---|---|---|---|---|---|
| Wet Gas Scrubber (Option 1*) | 36% | 29.82 | $ 59,675,000 | $ 6,339,900 | $ 401,475 |
| Wet Gas Scrubber (Option 2**) | 25% | 21.16 | $ 59,000,000 | $ 8,637,620 | $ 559,539 |

*Option 1 design basis is an emission rate of < 0.5 lbs filterable PM / 1000 lb coke burn
**Option 2 design basis is an emission rate of < 1.0 lbs filterable PM / 1000 lb coke burn

Generally BACT is more stringent than RACT. BACT costs/ton are typically in the range of $5,000 - $10,000/ton, and no higher than $12,000/ton. Tesoro believes the PM2.5 control costs listed above do not represent RACT.

H.11.a.iv.B – FCU NOx Limit 80 ppm

Tesoro requests the basis for limiting NOx emissions for purposes of the PM2.5 SIP. In many UDAQ Stakeholder meetings it has been stated that NOx reductions will do little to advance the attainment status of the PM2.5 standard. See comments above. In addition, Tesoro requests UDAQ provide the RACT analysis that supports adopting the proposed stringent FCU NOx limit.

Tesoro has determined that additional controls would be required to meet this more stringent limit. Below is a summary of the NOx control options and costs:

**NOx Control Options**

| Control Technology | Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Control Cost ($/ton) |
|---|---|---|---|---|---|
| SCR | 86% | 150.33 | $ 22,000,000 | $ 3,285,627 | $ 35,671 |
| Wet Gas Scrubber + LoTOx (Option 1*) | 86% | 150.33 | $ 74,675,000 | $ 9,134,526 | $ 107,656 |
| Wet Gas Scrubber + SCR | 86% | 150.33 | $ 81,675,000 | $ 9,625,527 | $ 115,317 |
| Wet Gas Scrubber + LoTOx (Option 2**) | 73% | 126.65 | $ 68,000,000 | $ 8,367,620 | $ 116,750 |
| SNCR | 20% | 34.80 | $ 5,611,327 | $ 235,761 | $ 21,995 |

*Option 1 design basis is a NOx emission rate of <10ppmd (annually) and <20ppmd (7 day average) at 0% O2
**Option 2 design basis is a NOx emission rate of <20ppmd (annually) and <40ppmd (7 day average) at 0% O2

It is important to note that the application of both the SNCR and SCR technologies require the injection of ammonia. Introducing ammonia can result in the formation of additional condensable PM emissions (e.g. ammonium nitrate) which are then emitted into an air shed which needs to come into attainment with the PM2.5 National Ambient Air Quality Standard. In addition, as noted above, UDAQ has communicated various times that NOx reductions result in no demonstrated PM2.5 air quality benefits. Therefore, Tesoro does not think it makes technical sense as part of the PM2.5 SIP to require a control technology to reduce a pollutant that may not improve the ability for the air shed to attain the PM2.5 standard, while at the same time increases emissions for PM2.5.

Generally BACT is more stringent than RACT. BACT costs/ton are typically in the range of $5,000 - $10,000/ton, and no higher than $12,000/ton. Tesoro believes the NOx control costs listed above do not represent RACT.

H.11.a.iv.C – FCU SO2 Limit

This proposed section of the rule ignores the applicability criteria of NSPS Subpart Ja and is applicable to all FCUs regardless of new, modified, or reconstructed status. By ignoring the NSPS Ja applicability criteria UDAQ is proposing a more stringent standard than the Federal regulation without the analysis that shows any reasonable benefit.

The PM2.5 SIP is being developed to address the 24 hour short term standard. Tesoro does not believe annual long term limits are appropriate for a short term (24-hour) PM2.5 ambient air quality standard given that attainment with the standard is a challenge during short-term time periods during the winter months.

In addition, Tesoro requests the state provide the RACT analysis that supports adopting the proposed stringent FCU $SO_2$ limits.

Tesoro has determined that additional controls would be required to meet this more stringent limit. Below is a summary of the SO2 control options and costs:

**SO2 Control Options**

| Control Technology | Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Control Cost ($/ton) |
|---|---|---|---|---|---|
| Wet Gas Scrubber (Option 1*) | 95% | 638.49 | $ 59,675,000 | $ 6,339,900 | $ 18,752 |
| Wet Gas Scrubber (Option 2**) | 88% | 589.09 | $ 59,000,000 | $ 6,272,900 | $ 20,102 |

*Option 1 design basis is an SO2 emission rate of <10ppmd (annually) and <18ppmd (7 day average) at 0% O2
**Option 2 design basis is an SO2 emission rate of <25ppmd (annually) and <50ppmd (7 day average) at 0% O2

Generally BACT is more stringent than RACT. BACT costs/ton are typically in the range of $5,000 - $10,000/ton, and no higher than $12,000/ton. Tesoro believes the SO2 control costs listed above do not represent RACT.

The installation of a Wet Gas Scrubber at the Tesoro Refinery would require significant planning and time to install. Tesoro is currently planning an outage for the Spring of 2013 and late 2014. A wet gas scrubber could not be installed in time for these scheduled shutdowns. The next scheduled turn-around will likely not occur until 2018 or 2019. If the above is deemed RACT Tesoro will need sufficient time to plan and install a WGS. Tesoro has already determined that the Publicly Owned Treatment Works (POTW) which currently accepts the facilities effluent would not accept a WGS purge stream due to the high level of total dissolved solids. Tesoro would need to explore installation of deep well injection or direct discharge to a receiving body of water and acquire the appropriate permits and/or land for any such discharge.

H.11.a.v.A - Sulfur Recovery Plant Limits

The 250 ppmv limit proposed ignores the size applicability criteria established in NSPS Subpart Ja. This limit is applicable to new SRU plants greater than 20 long tons per day. By ignoring the NSPS Ja applicability criteria the state is proposing a more stringent standard than the Federal regulation without the analysis that shows any reasonable

benefit. In addition the limit does not specify an averaging time as detailed in the NSPS Subpart Ja standard.

The sulfur pit exemption from limits specified is not complete. It is not clear which limit is referenced.

Tesoro is not submitting detailed cost data as a Tail Gas Treatment Unit (TGTU) is already proposed for the Waxy Crude Project. Tesoro believes these limits can be met with the proposed control device; however Tesoro does not believe the proposed standard is appropriate. The TGTU is expected to be installed in late 2014.

H.11.a.vi.B - Fuel Gas Combustion Devices

This section also ignores the applicability criteria of NSPS Subpart Ja and is applicable to all fuel gas combustion devices regardless if the unit is new, modified, or reconstructed. By ignoring the NSPS Ja applicability criteria the state is proposing a more stringent standard than the Federal regulation without the analysis that shows any reasonable benefit. In addition, Tesoro requests the state provide the RACT analysis that supports adopting the proposed stringent Fuel Gas Combustion Device limits.

The PM2.5 SIP is being developed to address the 24 hour short term standard. Tesoro does not believe annual long term limits are appropriate for a short term (24-hour) PM2.5 ambient air quality standard given that attainment with the standard is a challenge during short-term time periods during the winter months.

The June 1, 2012 NSPS Subpart Ja version established a definition for Fuel Gas Combustion Devices which excluded flares. To avoid confusion and misinterpretation of this proposed rule this definition should be included.

Tesoro currently meets the short term 162 ppm H2S standard. As stated above Tesoro does not believe a long term standard is warranted and requests the state delete the annual limit from the proposed rule.

H.11.a.vii - Flares

The proposed rule matches NSPS Subpart Ja 60.103a(a)(1) – (5) as currently promulgated and subsequently stayed by EPA for reconsideration. NSPS Ja was then signed on June 1, 2012 and pulled back for technical reasons. This is the most recent version of the rule after reconsideration.

Tesoro does not have any issues with the currently proposed version other than the following: We request that the paragraph D state "500,000 scf *above the baseline*; and" as this is consistent with the June 1, 2012 version of NSPS Ja standard. Tesoro also requests that UDAQ maintain the flexibility to incorporate the final NSPS Ja by reference.

Tesoro plans to install ports on our North Flare system during the scheduled 2013 turn-around for monitoring flow. The South Flare system is not scheduled for a turn-around until 2014. Installing monitoring equipment and then establishing a baseline will take additional time. Tesoro would need until approximately January 1, 2016 to meet this requirement.

Tesoro Specific SIP Limitations

Tesoro requests that the 0.261 ton per day (tpd) PM10 limit be listed as filterable PM10 only as determined by Method 201 or 201a. If UDAQ is proposing a limit which includes condensable PM emissions then an appropriate limit needs to be developed which would include condensable emissions. The proposed 0.261 tpd should remain filterable limit only as specified in the 2005 SIP and Tesoro's current Approval Order.

Tesoro proposes that the proposed PM2.5 limit be listed as applicable January 1, 2018, consistent with the proposed implementation date of the Refinery Rule:

> *Emissions of PM2.5 from the FCCU/CO Boiler shall be no greater than 4 lb/mmscf. Compliance shall be demonstrated with this limit by January 1, 2018.*

Tesoro proposes the following correction to the gas-fired compressor driver proposed limits which are consistent with the current Approval Order:

> *Emissions of NOX from each gas-fired compressor driver shall be no greater than 3.20 lb/hr or 933 ppmdv @10% oxygen and 400 deg F.*

Thank you for the opportunity to provide comments. Tesoro will continue to support UDAQ in their efforts to model attainment for the PM2.5 SIP.

Sincerely,

Matthew Buell
Health, Safety and Environmental Manager

cc: Bill Reiss, UDAQ

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DEPARTMENT OF
ENVIRONMENTAL QUALITY

September 24, 2012

TESORO

Tesoro Refining and Marketing Company
474 West 900 North
Salt Lake City, UT 84103-1494
801 521 4810

Mr. John Jenks
Utah Division of Air Quality
150 North 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820

**HAND DELIVERED**

**Re: Tesoro Refining and Marketing Company - Salt Lake City Refinery**
**PM2.5 SIP RACT Template Submittal**

Tesoro supports the efforts of the Utah Department of Air Quality to meet the PM2.5 24-hour standard through the State Implementation Plan process. Tesoro submits the attached PM2.5 SIP RACT Template Submittal. Please also reference our prior two submittals related to PM2.5 SIP RACT information for the Tesoro Salt Lake City Refinery:

- Letter submitted August 22, 2012 to John Jenks - Comments on Proposed Refinery Rule and Tesoro Specific SIP Limits letter
- Email submitted August 22, 2012 to John Jenks - Comments on Tesoro Refinery spreadsheet used for 2.0 modeling runs

Thank you for the opportunity to provide comments. Tesoro will continue to support UDAQ in their efforts to model attainment for the PM2.5 SIP.

Sincerely,

Matthew Buell
Health, Safety and Environmental Manager

attachment

cc: Bill Reiss, UDAQ

# Fluidized Catalytic Cracking Unit (FCCU)/ CO Boiler

## Fine Particulate Matter ($PM_{2.5}$) RACT Analysis

Tesoro currently complies with an emission limit of 1.0 lb/1,000-lb coke burn for filterable PM according to 40 CFR 60 Subpart J and 40 CFR 63 Subpart UUU by operating an electrostatic precipitator (ESP). This is equivalent to the recently finalized 40 CFR 60 Subpart Ja limit for modified or reconstructed FCCUs, and represents best demonstrated technology (BDT). Tesoro has determined that additional controls would be required to meet a more stringent limit of 0.5 lb/1,000-lb coke burn contained in 40 CFR 60 Subpart Ja for new FCCUs. The control technology evaluation for fine particulate matter ($PM_{2.5}$) emissions from the FCCU is as follows.

### Control Options:

The list of available control technologies for control of particulate matter emissions was developed from determinations in the Reasonable Available Control Technology / Best Available Control Technology / Lowest Available Emission Rate Clearinghouse (RBLC), including Electrostatic Precipitators (ESPs) and WGSs.

#### *Electrostatic Precipitators (ESP)*

Electrostatic precipitation of particles involves four steps:

1. Conditioning the air stream
2. Ionizing particles in the air stream
3. Collecting the charged particles on collector plates, and
4. Removing the charged particles from the plates.

ESPs are commonly used on FCCU flue gases. The Tesoro SLC refinery currently operates an ESP for control of opacity and particulate. ESPs have a level of efficiency greater than 90% under optimal operating conditions. They also have the advantage having of a relatively high efficiency for small particles and can be used for both wet and dry streams over a wide range of gas temperatures.

#### *Wet Gas Scrubbers (WGS)*

WGSs are used to reduce particulates in addition to $SO_2$. Flue gas enters the scrubbers where intensive gas/liquid contacting removes particulates by inertial impaction and/or condensation of liquid droplets on particles in the gas stream. Control efficiencies of 90% have been reported, although these installations are not typically downstream of another particulate matter control device.

### Technical Feasibility:

The control options identified are technically feasible. Table 1 presents the ranking of technically feasible particulate matter control technologies. Baseline emissions of particulate matter are based on the emission factors from the 7/7/11 performance testing downstream of the ESP, scaled up to the design operating rate of the FCCU. For Option 1, the WGS is specified to meet 0.5 lb filterable PM/1,000-lb coke burned. For Option 2, there is no improvement in filterable $PM_{2.5}$ removal expected above the base case operations of the ESP.

**Table 1 Ranking of Particulate Matter Control Technologies**

| Rank | Technology | Estimated Control Effectiveness (%) |
|---|---|---|
| 1 | Wet Gas Scrubber (WGS) (Option 1) | 36% |
| 2 | Wet Gas Scrubber (WGS) (Option 2) | 25% |
| N/A | Electrostatic Precipitator (ESP) | Base Case (typically >90%) |

The control effectiveness of the WGS is based on an engineering estimate of reductions in condensable PM emissions based on the level of control of $H_2SO_4$ emissions, plus any additional control of filterable PM expected. Because all $H_2SO_4$ emissions may not result in condensable PM emissions, the estimate of emissions reductions is expected to be conservatively high.

ESPs have a level of efficiency greater than 90% under optimal operating conditions. Tesoro currently operates an ESP and plans to continue operating this control device.

## Economic Feasibility:

The technically feasible control technologies are evaluated for their cost and environmental impacts below. Table 2 presents a summary of the cost effectiveness of the control options considered. Each control technology is discussed in further detail below. Refer to the control cost evaluation tables attached as Appendix B for more information. Tesoro has obtained multiple vendor quotes for the WGS system, and is presenting the most cost effective option below. The emission reduction and control cost is presented in terms of total $PM_{2.5}$.

**Table 2 Evaluation of $PM_{2.5}$ Control Technologies**

| Control Technology | Estimated Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Control Cost ($/ton) |
|---|---|---|---|---|---|
| WGS (Option 1) | 36% | 29.82 | $59,700,000 | $6,340,000 | $401,000 |
| WGS (Option 2) | 25% | 21.16 | $59,000,000 | $8,370,000 | $560,000 |
| Electrostatic Precipitator (ESP) | Base Case | | | | |

### *Wet Gas Scrubber (WGS)*

There are significant environmental and energy impacts associated with operation of a WGS. The blowdown from the WGS is expected to have high concentrations of TDS, particularly sodium sulfates from reaction of the caustic with $SO_2$ in the flue gases. Tesoro does not currently have a wastewater treatment plant capable of removing dissolved solids, and therefore must install technology (i.e., a reverse osmosis unit) to concentrate the wastewater stream. Whether significant additional treatment will be necessary to dispose of the wastewater stream is unknown at this point. Treatment options for high TDS streams include evaporation basins and evaporation-and-crystallization processes.

Tesoro must also dispose of the wastewater stream. Tesoro was recently informed by Salt Lake City POTW that due to the high TDS concentration, the scrubber purge stream would not be allowed to be discharged to the Salt Lake City POTW with Tesoro's other wastewater streams. Tesoro is investigating other potential discharge options including direct discharge via an NPDES permit or deep well injection.

Both treatment and disposal options have significantly higher costs than discharging to the POTW. Treatment costs at this time are unknown. Installation costs for deep well injection are estimated at $3MM per well, and redundant wells are recommended. Costs for acquiring right-of-way access for direct discharge to a stream and/or The Great Salt Lake are also unknown at this point.

Energy usage by the reverse osmosis system, scrubber water recirculation pumps, and the air fan to offset the pressure drop in the WGS are also significant. Installation of a WGS is not economically feasible, and there are significant energy and environmental impacts associated with operations.

The installation of a WGS would require significant planning and time to install. Tesoro is currently planning outages for the spring of 2013 and late 2014. A WGS could not be installed in time for these schedule shutdowns. The next scheduled turnaround will likely not occur until 2018 or 2019.

#### *Electrostatic Precipitator (ESP)*

Tesoro currently operates an ESP and plans to continue operating this control device. Advantages of the ESP system over the WGS are no wastewater impacts associated with the ESP system, and there are no visibility impacts due to a vapor plume.

#### $PM_{2.5}$ RACT Selection and Implementation Schedule

Continued operation of the ESP satisfies RACT. Installation of a WGS downstream of the ESP is not economically feasible for removal of particulate matter emissions.

## $SO_2$ RACT Analysis

Tesoro currently complies with an emission limit of 9.8 lb/1,000-lb coke burn for $SO_2$ according to 40 CFR 60 Subpart J by using $SO_x$ reduction additives. Tesoro has determined that additional controls would be required to meet more stringent limits of either 10 ppmvd or 25 ppmvd $SO_2$ on a 365-day rolling average. The control technology evaluation for $SO_2$ emissions from the FCCU is as follows.

### Control Options:

The list of available control technologies for reduction of $SO_x$ emissions was developed from from determinations in the RBLC, including feed hydrotreating, $SO_x$ Reduction Additives, and a WGS. Available control technologies are described below.

#### *Feed Hydrotreating*

Hydrotreating is a feed pretreatment process to remove chemically bound sulfur, nitrogen, and metals present in hydrocarbons and/or catalytically stabilize petroleum products by reacting them with hydrogen. A cat feed hydrotreater has two primary functions; improving the quality of the feed to the FCCU by removing impurities (sulfur and nitrogen) and increasing the hydrogen content by saturating the aromatics in the gas oil feed stocks.

Hydrotreating reduces the formation of sulfur oxides by reducing the overall sulfur content of the feedstock, and efficiencies vary depending on the feedstock sulfur content. The potential $SO_x$ removal efficiency of a Hydrotreatment unit is estimated to be 50% to 85%.

### *$SO_x$ Reduction Additives (DeSOx)*

$SO_x$ reduction additives remove $SO_x$ from the regenerator flue gas and release sulfur as $H_2S$ in the FCCU reactor. $SO_x$ reduction additives are more effective at adsorbing $SO_3$ than $SO_2$ at regenerator conditions. The $SO_x$ reduction additive therefore contains two components – a metal based oxidation catalyst to promote the conversion of $SO_2$ to $SO_3$ and a magnesium based "pick up agent" to remove the $SO_3$ from the regenerator as a magnesium sulfate and release it as $H_2S$ in the reactor or stripper.

Typical $SO_x$ additive levels in the catalyst range from 1-10%. Removal efficiencies have typically been in the range of 20 – 60% but efficiencies of up to 85% or better have been achieved. Manufacturers of $SO_x$ reduction additives include Grace Davison (DeSOX®) and INTERCAT (SOxGETTER™ and Super SOxGETTER™).

Tesoro currently uses $SO_x$ reduction additives in its process to control $SO_x$ emissions. Changes to the FCCU as a result of the Waxy Crude Processing Project are not expected to affect the control effectiveness of the $SO_x$ reduction additives.

### *Wet Gas Scrubbers (WGS)*

A WGS chemically removes $SO_2$ emissions using aqueous solutions. Flue gas enters the scrubber where intensive gas/liquid contacting removes sulfur oxides by absorption, neutralization, and partial oxidation to sulfates. The most widely used scrubbing media are limestone slurry and caustic, although some processes utilize other media. $SO_2$ control efficiencies of 95% have been reported depending on the application. The cleaned stream is discharged to the atmosphere, while the scrubbing solution is treated and/or dewatered prior to discharge. A WGS will also effectively control particulates and allow for $NO_x$ removal when combined with the LoTOx system.

### Technical Feasibility:

Hydrotreatment is considered a technically infeasible option at the Tesoro Salt Lake City Refinery. The Salt Lake City Refinery does not have a vacuum tower to separate the vacuum gas oil from the residual oil and there is no viable technology to hydrotreat FCCU feed that contains residual oil. Since Tesoro does not have the process equipment to operate a hydrotreatment unit, it is not considered to be an applicable control technology.

Although Tesoro does not view hydrotreatment as a technically feasible control technology, a summary of the costs to install the additional process equipment is provided for informational purposes. The cost to install a vacuum tower and catalytic feed hydrotreater (CFU) would be approximately $200 to $300 million. Tesoro would also need to install a coking unit to treat the residual oil from the vacuum tower, at a cost of an additional $200 to $300 million.

The quoted costs assume that the following would also be required:

- Hydrogen unit to produce hydrogen for the CFU
- Coking Unit VRU or modifications to the existing FCCU VRU
- Rail loading facilities for the coke and a coke storage area.

- Changes to the SRU to accommodate additional amine regeneration and sulfur production.

Table 3 presents the ranking of technically feasible $SO_2$ control technologies. Baseline emissions for $SO_2$ are based on the current potential to emit of the unit, equal to 671.43 tons per year as limited by the facility's Approval Order. This is derived from the facility $SO_x$ emission limit of 705 tons per year, proportioned to $SO_2$ by the assumption that $SO_3$ emissions are equal to 5% of the $SO_2$ emissions.

**Table 3 Ranking of $SO_2$ Control Technologies**

| Rank | Technology | Estimated Control Effectiveness (%) |
|---|---|---|
| 1 | Wet Gas Scrubber (WGS) (10 ppmvd outlet $SO_2$) | 95% |
| 2 | Wet Gas Scrubber (WGS) (25 ppmvd outlet $SO_2$) | 88% |
| N/A | $SO_x$ Reduction Additives | Base Case |

The control effectiveness of the WGS is based on achieving an outlet concentration of 10 ppmvd $SO_2$ at 0% $O_2$, which is consistent with recent emission limits set under consent decrees for FCCUs. An additional option was considered for the WGS for achieving a less stringent emission limit of 25 ppmvd $SO_2$ at 0% $O_2$, which is consistent with the most stringent determinations from the RBLC. The modifications to the FCCU are not expected to change the effectiveness of the $SO_x$ reduction additives.

## Economic Feasibility:

The technically feasible control technologies are evaluated for their cost and environmental impacts below. Table 4 presents a summary of the cost effectiveness of the control options considered. Each control technology is discussed in further detail below. Tesoro has obtained multiple vendor quotes for the WGS system, and is presenting the most cost effective options below.

**Table 4 Evaluation of $SO_2$ Control Technologies**

| Control Technology | Estimated Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Control Cost ($/ton) |
|---|---|---|---|---|---|
| WGS (Option 1) | 95% | 638.49 | $59,700,000 | $6,340,000 | $18,800 |
| WGS (Option 2) | 88% | 589.09 | $59,000,000 | $6,270,000 | $20,100 |
| $SO_x$ Reduction Additives | Base Case | | | | |

### *Wet Gas Scrubbers (WGS)*

Installation of a WGS is not economically feasible, and there are significant energy and environmental impacts associated with operations as described in the $PM_{2.5}$ RACT analysis.

### *$SO_x$ Reduction Additives (DeSOx)*

Tesoro currently uses $SO_x$ reduction additives to maintain compliance with the NSPS requirements. Tesoro uses an automatic $SO_x$ reduction additive loader. The additive is loaded to the regenerator based on $SO_x$ emissions. Besides additive costs, there are no other operating costs associated with reduction additives. The cost effectiveness of the technology was estimated to be $1,000 per ton removed as part of Tesoro's 2007 BACT analysis. Relative to add on control devices, there are minimal reliability issues associated with the addition of $SO_x$ reduction additives and no other significant environmental impacts associated with their use.

### $SO_2$ RACT Selection and Implementation Schedule

Tesoro proposes the continued use of $SO_x$ reduction additives as RACT. $SO_x$ reduction additives are cost effective and can remove significant quantities of $SO_x$ emissions. Installation of a WGS is not economically feasible, and there are significant energy and environmental impacts associated with operations.

## VOC RACT Analysis

VOC emissions from the FCCU are less than 1 tpy due to operation of the CO Boiler for destruction of regenerator gases.

### Control Options:

There are no technically feasible control options due to the extremely low concentration of VOCs in the exhaust stream following the CO Boiler. Tesoro's current operation of the CO Boiler satisfies RACT.

### Technical Feasibility:

N/A

### Economic Feasibility:

N/A

### Implementation Schedule:

N/A

## $NO_x$ RACT Analysis

The control technology evaluation for $NO_x$ emissions from the FCCU is as follows.

### Control Options:

The list of available control technologies for reduction of $NO_x$ emissions was developed from determinations in the RBLC, including feed hydrotreating, $NO_x$ Reduction Additives, LoTOx™ $NO_x$ Removal, low $NO_x$ burners, Selective Catalytic Reduction (SCR), and Selective Non-Catalytic Reduction (SNCR)/Enhanced SNCR. Available control technologies are described below.

### *Feed Hydrotreating*

Hydrotreating is a feed pretreatment process to remove chemically bound sulfur, nitrogen, and metals present in hydrocarbons and/or catalytically stabilize petroleum products by reacting them with hydrogen. A cat feed hydrotreater has two primary functions; improving the quality of the feed to the FCCU by removing impurities (sulfur and nitrogen) and increasing the hydrogen content by saturating the aromatics in the gas oil feed stocks.

Hydrotreating reduces the formation of fuel-based $NO_x$ by reducing the overall nitrogen content of the feedstock, and efficiencies vary depending on feedstock nitrogen content. The potential $NO_x$ removal efficiency of a hydrotreatment unit is estimated to be 50% to 85%.

### *$NO_x$ Reduction Additives*

In full combustion FCCUs, $NO_x$ formation is closely correlated with excess $O_2$. $NO_x$ reduction additives reduce $NO_x$ in the FCC regenerator by adsorbing NO and converting it to $N_2$. Optimal effects are typically achieved at the addition rate of 1-2%. $NO_x$ reduction levels are typically in the 40-50% range with reduction catalysts; however, reductions as large as 75% have reportedly been achieved. There are several manufacturers of $NO_x$ reduction additives including Grace Davison (DENOX®) and INTERCAT ($NO_x$GETTER™).

In partial combustion FCCUs, $NO_x$ reduction additives are not effective reducing agents as indicated by multiple vendors. Testing has indicated that during partial burn operations where CO concentrations are greater than 2%, no measurable reduction of $NO_x$ emissions will occur. At these high CO concentrations, there is essentially no $NO_x$ formed in the regenerator due to the reducing conditions. Nitrogen is emitted from the regenerator in the form of ammonia or hydrogen cyanide and later oxidized to $NO_x$ in the CO Boiler.

Tesoro currently operates its FCCU in partial burn mode. Therefore, $NO_x$ reduction additives will be ineffective at reducing $NO_x$ emissions.

### *LoTOX ™$NO_x$ Removal*

LoTOx, a product of Belco, is a low temperature technology that uses ozone to oxidize insoluble $NO_x$ to highly soluble nitric pentoxide ($N_2O_5$), which reacts with moisture in the flue gas to form nitric acid ($HNO_3$). The nitric acid is then removed in a downstream Wet Gas Scrubber (WGS), which Tesoro would need to install in order to properly operate the LoTOx system. Documentation suggests that 90% removal efficiency is achievable with LoTOx.

### *Low $NO_x$ Burners (LNB)*

LNB are designed to optimize the oxygen-fuel mixture within the burner and because LNB reduce the temperature of the flame, they reduce the formation of thermal $NO_x$ by 30% to 50%. LNB have no effect on fuel-based $NO_x$ formation.

### *Selective Catalytic Reduction (SCR)*

SCR is a post-combustion $NO_x$ control technique which involves the mixing of anhydrous or aqueous ammonia ($NH_3$) vapor with flue gas and passing the mixture through a catalyst bed at temperatures between 600 and 800 °F to reduce $NO_x$ to form molecular nitrogen ($N_2$) and water. Documentation suggests that SCR can achieve control efficiencies exceeding 90% depending on inlet conditions.

### *Selective Non-Catalytic Reduction (SNCR)/Enhanced SNCR*

SNCR is another post-combustion process involving the injection of ammonia or urea ($CO(NH_2)_2$) into the flue gas at an appropriate temperature window of 1,600 to 1,900 °F, but unlike SCR it does not employ a catalyst. The injected chemicals selectively reduce the $NO_x$ to $N_2$ and water. Documentation suggests control efficiencies of 50 -70% have been achieved at coal plants; however FCCU efficiencies typically range from 20-35%. Enhanced SNCR, involving the injection of hydrogen, can lower the temperature window of the effective range to 1,400 °F.[1]

### Technical Feasibility:

Hydrotreatment, $NO_x$ reduction additives, and LNB are not technically feasible options for reducing $NO_x$ emissions for reasons described below.

### *Hydrotreatment*

As stated previously in the $SO_2$ RACT analysis, hydrotreatment is considered a technically infeasible option at the Tesoro Salt Lake City Refinery.

### *$NO_x$ Reduction Additives*

Tesoro operates its FCCU in partial burn mode as a result of the characteristics of its FCCU feed. As previously described, $NO_x$ reduction additives are not effective in partial burn mode; therefore, they are not considered a technically feasible control technology.

### *Low $NO_x$ burners (LNB)*

While LNB appear in the RBLC as an available technology for FCCU regeneration, it is more likely that these were used in CO boilers. LNB works by reducing the temperature of the flame, which in turn reduces the formation of thermal $NO_x$ by 30% to 50%. However, regenerator temperatures are generally not high enough to create large amounts of thermal $NO_x$. Although fuel $NO_x$ is not created directly in the regenerator, the reduced nitrogen compounds readily form $NO_x$ at the CO Boiler. LNB are not considered an effective control technology for this application since they will not control fuel $NO_x$.

### *Control Technology Ranking*

Table 5 presents the ranking of technically feasible $NO_x$ control technologies. Baseline emissions for $NO_x$ are based on the current potential to emit of the unit, equal to 174 tons per year as limited by the facility's Approval Order.

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[1] U.S. Environmental Protection Agency (EPA), Emission Standards Division. *Alternative Control Techniques Document – $NO_X$ Emissions from Process Heaters (Revised).* EPA-453/R-93-034. September 1993.

**Table 5 Ranking of $NO_x$ Control Technologies**

| Rank | Technology | Estimated Control Effectiveness (%) |
|---|---|---|
| 1 | Selective Catalytic Reduction (SCR) | 86% |
| 1 | LoTOx (10 ppmvd outlet $NO_x$) | 86% |
| 3 | LoTOx (20 ppmvd outlet $NO_x$) | 73% |
| 4 | Selective Non-Catalytic Reduction (SNCR) | 20% |

The control effectiveness of SCR and LoTOx are based on achieving an outlet concentration of 10 ppmvd $NO_x$ at 0% $O_2$, consistent with recent emission limits set under consent decrees for FCCUs. An additional option was considered for LoTOx for achieving a less stringent emission limit of 20 ppmvd $NO_x$ at 0% $O_2$, consistent with the most stringent determinations from the RBLC. Until a detailed design basis study is performed to ascertain the feasible level of control for the SLC FCCU, a range is of 10-20 ppmvd is assumed.

The control effectiveness of SNCR was based on information from the vendor FuelTech. Control effectiveness is strongly dependent upon flue gas temperature. The CO Boiler flue gas temperature is in the range of 1200-1300 °F. The vendor information suggests that SNCR may not be effective in this temperature range, even with the injection of hydrogen. The control efficiency is very conservatively estimated to be 20% for purposes of this RACT analysis since there have been no site-specific studies conducted to confirm SNCR performance.

### Economic Feasibility:

The technically feasible control technologies are evaluated for their cost and environmental impacts. Table 6 presents a summary of the cost effectiveness of the control options considered. The impacts of each control technology are discussed in further detail below. Refer to the control cost evaluation tables attached as Appendix B for more information. Tesoro has obtained vendor quotes for SCR and LoTOx for the Salt Lake City Refinery, and has relied on a vendor quote for Tesoro's Anacortes Refinery for SNCR.

**Table 6 Cost Evaluation of $NO_x$ Control Technologies**

| Control Technology | Estimated Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Average Control Cost Effectiveness ($/ton) |
|---|---|---|---|---|---|
| SCR | 86% | 150.33 | $22,000,000 | $3,300,000 | $36,000 |
| Wet Scrubber + LoTOx (10 ppmvd outlet $NO_x$) | 86% | 150.33 | $74,700,000 | $9,100,000 | $108,000 |
| Wet Scrubber + SCR | 86% | 150.33 | $81,700,000 | $9,600,000 | $115,000 |
| Wet Scrubber + LoTOx (20 ppmvd outlet $NO_x$) | 73% | 126.65 | $68,000,000 | $8,400,000 | $117,000 |
| SNCR | 20% | 34.80 | $5,600,000 | $240,000 | $22,000 |

### *Selective Catalytic Reduction (SCR)*

SCR offers the highest percentage reduction of the technically feasible $NO_x$ reduction techniques, along with LoTOx. The use of SCR inherently results in ammonia slip and additional condensable PM emissions (e.g., ammonium nitrates and sulfates). Up to an additional 37 tons per year of in-stack condensable PM could be emitted from the formation of ammonium sulfates, which would require a federal non-attainment New Source Review permit for that increase in emissions (PM, $PM_{10}$ and $PM_{2.5}$). Tesoro has therefore considered SCR in combination with a WGS in order to address these concerns. SCR is not a cost effective option with or without installation of a WGS.

Due to the significant costs as well as the potential environmental impacts, SCR is eliminated as a control option.

### *LoTOx ™$NO_x$ Removal*

LoTOx offers the highest percentage reduction of the technically feasible $NO_x$ reduction techniques, along with SCR. LoTOx results in ozone slip, which would require an analysis of environmental and permitting implications for corresponding direct ozone emissions. Because LoTOx requires the use of a wet gas scrubber, installation of the WGS must also be considered when assessing the cost effectiveness of this technology.

LoTOx has the potential to significantly reduce NOx emissions, but there are significant environmental and energy impacts associated with operation of a WGS associated with LoTOx. The blowdown from the WGS is expected to have high concentrations of total dissolved solids (TDS), particularly sodium nitrate from absorption of the oxidized nitrogen compounds in the flue gases. Tesoro does not currently have a wastewater treatment plant capable of removing these levels of nitrates, and therefore must install technology (i.e., reverse osmosis unit) to concentrate the wastewater stream. Whether significant additional treatment will be necessary to dispose of the wastewater stream is unknown at this point. Treatment options for high TDS streams include evaporation basins and evaporation-and-crystallization processes.

Tesoro must also dispose of the wastewater stream. Tesoro was recently informed by Salt Lake City POTW that due to the high TDS concentration, the scrubber purge stream would not be allowed to be discharged to the Salt Lake City POTW with Tesoro's other wastewater streams. Tesoro is investigating other potential discharge options including direct discharge via an NPDES permit or deep well injection.

Both treatment and disposal options have significantly higher costs than discharging to the POTW. Treatment costs at this time are unknown. Installation costs for deep well injection are estimated at $3MM per well, and redundant wells are recommended. Costs for acquiring right-of-way access for direct discharge to a stream and/or The Great Salt Lake are also unknown at this point.

Energy usage by the ozone generation units, reverse osmosis system, scrubber water recirculation pumps, and the air fan to offset the pressure drop in the WGS are also significant. Installation of LoTOx is not economically feasible since its costs are greater than $108,000 per ton of pollutant removed, and there are significant energy and environmental impacts associated with operations.

### *Selective Non-Catalytic Reduction (SNCR)/Enhanced SNCR*

Similar to SCR, SNCR/Enhanced SNCR results in ammonia slip and incremental condensable PM emissions. The costs do not include hydrogen injection for Enhanced SNCR. SNCR/Enhanced SNCR is not a cost effective option with or without installation of additional PM controls, therefore SNCR/Enhanced SNCR is eliminated as a control option.

### NOx RACT Selection and Implementation Schedule

Available control technologies are not technically or economically feasible for control of NOx emissions from the FCCU/ CO Boiler. Tesoro will continue to operate in compliance with its existing emission limit of 174 tons per year.

# Process Heaters/ Furnaces (H-101, F-1, F-15, F-680, F-681, & F-701)

## $SO_2$ RACT Options

Tesoro's current and projected future operations meet best demonstrated technology (BDT) requirements. BDT is represented by NSPS Subpart Ja, which states that the owner or operator shall not burn fuel gas with more than 60 ppmv H2S, based on a 365 day average. In 2008, the average H2S content was 37 ppmv. Additionally, the projected H2S content at the refinery used to calculate 2017 emissions is 50 ppm. Since the standard is already being met, no reductions would occur from enforcing the standard. Tesoro's current operations satisfy RACT.

## $NO_X$ RACT Options

Current emissions performance is as follows.

| Emission Unit | NOx Emissions (lb/MMBtu) and Controls |
|---|---|
| H-101 (162 MMBtu/hr) | 0.04 (ULNB) |
| F-1 (86.6 MMBtu/hr) | 0.10 (LNB) |
| F-15 (6.3 MMBtu/hr) | 0.10 (LNB) |
| F-680 (15.6 MMBtu/hr) | 0.04 (ULNB) |
| F-681 (22.1 MMBtu/hr) | 0.04 (ULNB) |
| F-701 (8.0 MMBtu/hr) | 0.07 (LNB) |

Tesoro's operations of H-101, F-680, and F-681 meet best demonstrated technology (BDT) requirements. BDT is represented by NSPS Subpart Ja, which states that the owner or operator shall meet a NOx emission limit of 0.04 or 0.06 lb/MMBtu for natural or forced draft process heaters, respectively.

### Control Options:

Available control options considered consists of: Low NOx burners (LNB), Ultra-Low NOx Burners (ULNB), and selective catalytic reduction (SCR). All process heaters have existing controls equivalent or better than LNB; therefore, only ULNB and SCR are considered further.

### Technical Feasibility:

Furnaces H-101, F-680, and F-681 are already well controlled and satisfy RACT.

Furnaces F-701 and F-15 have insignificant $NO_x$ emissions because their maximum heat input capacities are less than 10 MMBtu/hr. ULNB and SCR are technically feasible control options.

ULNB and SCR are technically feasible control options for Furnace F-1.

### Economic Feasibility:

Cost effectiveness for ULNB and for SCR at Furnace F-1 is currently being evaluated by Tesoro with the assistance of vendors. Furnace F-1 has wall-mounted burners, therefore cost information for other process heaters cannot be extrapolated to estimate costs at Furnace F-1. Economic feasibility is uncertain at this time, but Tesoro expects that cost information will be available by no later than the end of October. Tesoro will provide an evaluation of economic feasibility to UDAQ when it is available.

Tesoro assumes that additional controls on Furnaces F-701 and F-15 are economically infeasible based on a similar evaluation completed for Furnace H-101. Furnace H-101 is significantly larger than either F-701 or F-15, and the estimated control cost of ULNB is $12,000 per ton of $NO_x$ removed. The costs would be significantly higher per ton of NOx removed for F-701 and F-15 because the units are much smaller in capacity.

### Implementation Schedule:

Tesoro will confirm an implementation schedule if it is determined that additional controls on Furnace F-1 are economically feasible.

## $PM_{2.5}$ RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant. Units will comply with 40 CFR 63 Subpart DDDDD (when effective), which will require work practice standards to improve performance of the units.

## VOC RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant. Units will comply with 40 CFR 63 Subpart DDDDD (when effective), which will require work practice standards to improve performance of the units.

# Cogeneration Units (Cogens) (East and West Train)

## $SO_2$ RACT Options

The Cogens are fired on natural gas and refinery fuel gases. As noted for the process heaters, the refinery fuel gas meets BDT requirements since its H2S content would comply with NSPS Subpart Ja requirements (if applicable).

### Control Options:

There are no technically feasible control options due to the extremely low concentration of $SO_2$ in the exhaust stream. Tesoro's current operations satisfy RACT.

### Technical Feasibility:

N/A

### Economic Feasibility:

N/A

### Implementation Schedule:

N/A

## $NO_X$ RACT Options

Tesoro currently complies with existing NSPS standards under Subpart GG. The Cogens are each guaranteed to meet 32 ppm @ 15% $O_2$, which met BACT at time of installation in 2003.

### Control Options:

SCR is an available control option for each of the Cogens.

### Technical Feasibility:

Yes

### Economic Feasibility:

Cost effectiveness is estimated using capital cost information from a vendor and operating costs calculated from correlations developed by EPA and EPRI.

| Control Technology | Estimated Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Average Control Cost Effectiveness ($/ton) |
|---|---|---|---|---|---|
| SCR | 90% | 56.2 | $5,000,000 | $180,000 | $12,000 |

The use of SCR inherently results in ammonia slip, and potentially formation of additional condensable PM emissions (e.g., ammonium nitrates and sulfates) from the stack. Tesoro considers SCR to be economically infeasible under RACT at $12,000 per ton of NOx removed.

### Implementation Schedule:

N/A

## $PM_{2.5}$ RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant.

## VOC RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant.

# Sulfur Recover Unit (SRU)

## $SO_2$ RACT Options

Tesoro is proposing to install a Tail Gas Treatment Unit (TGTU) as part of the Waxy Crude Processing Project. The TGTU will reduce emissions to levels better than BDT for SRUs. RACT is considered to be equivalent to BDT, which is set by NSPS Subpart Ja. NSPS Subpart Ja requires that SRUs with a capacity less than 20 long tons per day meet a limit of 2,500 ppmvd $SO_2$ at 0% $O_2$. Installation of the TGTU will result in emissions from the SRU significantly below the concentration limit in NSPS Subpart Ja. Installation of the TGTU as part of the Waxy Crude Processing Project therefore satisfies RACT.

Installation of the TGTU will result in an emission reduction of 259 tpy $SO_2$ compared to current operations. The TGTU is expected to be installed in late 2014.

### Control Options:

There are no additional control options feasible for the SRU beyond the TGTU.

### Technical Feasibility:

N/A

### Economic Feasibility:

N/A

### Implementation Schedule:

N/A

## $PM_{2.5}$ RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant.

## VOC RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant.

## $NO_X$ RACT Options

N/A – Insignificant emissions from these units, and there are no technically and economically feasible control options for this pollutant.

# Storage Tanks

## VOC RACT Options

Tesoro has reduced emissions from its storage tanks since the 2008 baseline, and intends to further reduce emissions prior to 2014. The emission reductions implemented are as follows:

- In 2011, several storage tanks (Tanks 243, 245, 298, 324, 327, 330, and 405) had slotted guidepole controls installed. These installations reduced emissions by approximately 1 tpy each.
- Tank 188 will be replaced as part of the Waxy Crude Processing Project and will include an internal floating roof (IFR). This retrofit will reduce emissions by 0.15 tpy compared to 2010 actual emissions and 7.80 tpy compared to 2011 actual emissions when Black Wax crude was stored full-time in the tank.
- Tank 291 will also be retrofitted with an IFR as part of the Waxy Crude Processing Project, which will reduce emissions by 8.8 tpy compared to 2010 actual emissions.
- Tank degassing emissions are now controlled by portable combustion units. In 2008, emissions were 21.20 tpy from uncontrolled degassing events. Assuming a similar number of tank degassing events occur during each year, emissions would be reduced by approximately 20.78 tpy based on a 95% control efficiency.

### Control Options:

Tesoro has considered installation of additional slotted guidepole controls, and continued control of tank degassing emissions using vapor combustors as RACT control options.

### Technical Feasibility:

Yes

### Economic Feasibility:

Yes

### Implementation Schedule:

Tesoro will operate degassing controls when storage tanks are taken out of service. Slotted guidepole controls will be implemented on storage tanks prior to bringing them back into service.

## $PM_{2.5}$ RACT Options

N/A – no emissions from these units.

## VOC RACT Options

N/A – no emissions from these units.

## $NO_X$ RACT Options

N/A – no emissions from these units.

# Fugitive Equipment and Wastewater System

## VOC RACT Options

Tesoro currently controls and monitors its fugitive equipment and wastewater system as follows:

- Tesoro is required to comply with its consent decree containing leak detection and repair (LDAR) requirements equivalent to NSPS Subpart GGGa.
- Tesoro's API separators are fitted with floating covers.
- Tesoro monitors its drains annually in accordance with Utah Rule R307-326-9. Monitored missions in 2008 from drains were 4.5 tpy.

### Control Options:

Tesoro's current LDAR program is equivalent to BDT and therefore satisfies RACT. Tesoro's wastewater system is not a significant source of VOC emissions (15.69 tpy), and these VOC emissions are spread over several sources (drains, junction boxes, flume, API separators, dissolved air flotation unit). Implementation of additional controls involves site-specific engineering and cost evalulations, which cannot easily be generalized from other sources. Tesoro has therefore not conducted any further analysis of the feasibility of additional controls at this time.

### Technical Feasibility:

N/A

### Economic Feasibility:

N/A

### Implementation Schedule:

N/A

## $PM_{2.5}$ RACT Options

N/A – no emissions from these units.

## $SO_2$ RACT Options

N/A – no emissions from these units.

## $NO_X$ RACT Options

N/A – no emissions from these units.

# Flares

## RACT Options for $NO_X$, $SO_2$, $PM_{2.5}$, VOC

### Control Options:

Tesoro's North and South Flare are subject to the requirements of NSPS Subpart Ja. Subpart Ja represents BDT and will require that: 1) flow and sulfur species monitoring systems be installed to better understand emissions from the flares, and 2) a flare management plan will be developed and implemented; note that the flare management plan will require amongst other items the evaluation of the technical and economic feasibility of flare gas recovery, source reduction and source minimization.

Beyond compliance with Subpart Ja, a flare gas recovery system could be installed to collect gases which would normally go to the flare header. This system would be comprised of four compressors which are designed to collect all of the gases that would result from incidents (e.g. unit trips). Normally, only two of these compressors would need to run to recover the gases routed to the flares. The remainder of this analysis focuses on installation of a flare gas recovery system.

### Technical Feasibility:

Yes

### Economic Feasibility:

Cost effectiveness is estimated using vendor quotes from a control cost evaluation conducted for another Tesoro facility. The cost of installing a flare gas recovery system is not economically feasible. See table below.

| Pollutant | Estimated Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Average Control Cost Effectiveness ($/ton) |
|---|---|---|---|---|---|
| $NO_X$ | 100% | 12.9 | $24,000,000 | $1,450,000 | $290,000 |
| $SO_2$ | 100% | 2.2 | $24,000,000 | $1,450,000 | $1,700,000 |
| $PM_{2.5}$ | 100% | 1.4 | $24,000,000 | $1,450,000 | $2,600,000 |
| VOC | 100% | 26.6 | $24,000,000 | $1,450,000 | $140,000 |

### Implementation Schedule:

The requirements under Subpart Ja satisfy the requirements of RACT. Tesoro will meet these requirements in accordance with the schedule outlined in Subpart Ja (within 3 years from 11/13/12). Tesoro plans to install ports on its North Flare system during the scheduled 2013 turnaround for monitoring flow. The South Flare system is not scheduled for a turnaround until 2014.

# Cooling Towers

## VOC RACT Options

### Control Options:

Tesoro will comply with the heat exchanger standards of MACT Subpart CC, which satisfies RACT as BDT.

### Technical Feasibility:

Yes

### Economic Feasibility:

Yes

### Implementation Schedule:

Tesoro will comply with the heat exchanger standards of MACT Subpart CC by the effective date of 10/29/2012.

## $PM_{2.5}$ RACT Options

The cooling towers operate with drift eliminators to control the amount of $PM_{2.5}$ emitted to the atmosphere. Additionally, the amount of $PM_{2.5}$ emitted can be refined from the total PM emission rate using a particle size distribution from "Calculating Realistic $PM_{10}$ Emissions from Cooling Towers," Reisman and Frisbie, Proceedings of 2001 A&WMA ACE. The particle size distribution indicates that only 0.2% of total PM emitted is $PM_{2.5}$; as a result, $PM_{2.5}$ emissions from each cooling tower are less than 1 tpy. Additional control of $PM_{2.5}$ emissions from the cooling towers is technically and economically infeasible.

## $SO_2$ RACT Options

N/A – no emissions from these units.

## $NO_X$ RACT Options

N/A – no emissions from these units.

# K1 compressors

## RACT Options for $NO_X$, $SO_2$, $PM_{2.5}$, VOC

### Control Options:

Tesoro SLC reviewed the feasibility of replacing the natural gas powered compressors with electric compressors. Due to spacing constraints, only one of the two K1 compressors could be retrofitted.

### Technical Feasibility:

Yes (for one compressor)

### Economic Feasibility:

Cost effectiveness is estimated using an engineering analysis conducted by the refinery. The cost of replacing one of the compressors is not economically feasible. See table below.

| Pollutant | Estimated Control Efficiency (%) | Emission Reduction (tpy) | Installed Capital Cost ($) | Operating Costs ($/year) | Average Control Cost Effectiveness ($/ton) |
|---|---|---|---|---|---|
| $NO_X$ | 100% | 7.9 | $1,800,000 | $264,000 | $55,000 |
| $SO_2$ | 100% | 0.0 | $1,800,000 | $264,000 | $75,000,000 |
| $PM_{2.5}$ | 100% | 0.2 | $1,800,000 | $264,000 | $2,800,000 |
| VOC | 100% | 0.3 | $1,800,000 | $264,000 | $1,500,000 |

### Implementation Schedule:

N/A

# Attachment 2

Utah Petroleum Association

Phone: (801) 364-1510
Email: upa@utahpetroleum.org
Web: www.utahpetroleum.org

August 10, 2012

Mr. John Jenks
New Source Review
Utah Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114-482

Dear John:

UPA members received a copy of the proposed rule *Emissions Standards: Boilers, Steam Generators, and Process Heaters* on August 7, 2012 and comments were requested by August 10, 2012. Given the time constraints only general comments are provided and these comments should not be viewed as comprehensive. Individual UPA members may provide additional and more specific comments.

The stated purpose of this rule is $NO_X$ reduction, while everything communicated from UDAQ on PM2.5 nonattainment shows that $NO_X$ is not a significant contributor to the state's winter PM2.5 issues. Because this rule was not developed to address air quality issues specific to Utah (reference San Joaquin Valley APCD rule 4306), UPA believes many of the proposed provisions are not applicable and would not be effective in addressing Utah specific air quality issues. The provisions of this rule would require extensive retrofits, additional controls, and monitoring equipment on virtually every installed heater and boiler (approximately 70) at Salt Lake area refineries. Some heaters or boilers may require total replacement. These changes would result no demonstrated PM2.5 air quality benefits and according to data provided by UDAQ may actually increase PM2.5 concentrations. UPA requests that UDAQ provide data which adequately supports the conclusion that the required controls under this rule show progress towards improving PM2.5 attainment.

Additionally the limits proposed in this rule are much more stringent than similar EPA limits found in NSPS Ja and NSPS Db. The averaging time (15 minutes vs 30 day rolling average) is also much more stringent than NSPS. UPA requests that UDAQ provide clarification on the additional benefit to going beyond the standards contained in NSPS Ja and Db. The implementation schedule is also unreasonable and not compatible with scheduled refinery turnarounds.

Given the above, it does not appear that this rule represents RACT. UPA requests that UDAQ provide the RACT analysis used to justify this rule. We appreciate your attention to this important matter. I can be reached with any response at (801) 364-1510 or lpeacock@utahpetroleum.org.

Sincerely,

Lee J. Peacock
President

# Attachment 3

# Potential Nonroad Mobile Source Control Measures

| Source Category | Control Measure | Primary Pollutant Reductions Achieved | | |
|---|---|---|---|---|
| | | VOC | NOx | PM |
| Diesel-powered equipment | Diesel particulate filter (PDF) retrofit | + | | + |
| Diesel-powered equipment | Selective catalytic reduction (SCR) retrofit | | + | |
| Diesel-powered equipment | Engine rebuild retrofit | | + | + |
| Airport ground support equipment | Electrification of airport GSE | | + | + |
| Diesel-powered equipment | Scrappage program | | + | + |
| Diesel-powered equipment | Fleet requirements | | + | + |

# Potential Nonroad Mobile Source Control Measures

| Source Category | Control Measure | Primary Pollutant Reductions Achieved | | |
|---|---|---|---|---|
| | | VOC | NOx | PM |
| Diesel-powered equipment | Diesel particulate filter (PDF) retrofit | + | | + |
| Diesel-powered equipment | Selective catalytic reduction (SCR) retrofit | | + | |
| Diesel-powered equipment | Engine rebuild retrofit | | + | + |
| Airport ground support equipment | Electrification of airport GSE | | + | + |
| Diesel-powered equipment | Scrappage program | | + | + |
| Diesel-powered equipment | Fleet requirements | | + | + |